



Welcome to [E-XFL.COM](https://www.e-xfl.com)

What is "[Embedded - Microcontrollers](#)"?

"[Embedded - Microcontrollers](#)" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" because they are embedded within electronic devices to control various functions, rather than serving as standalone computers. Microcontrollers are crucial in modern electronics, providing the intelligence and control needed for a wide range of applications.

Applications of "[Embedded - Microcontrollers](#)"

Details

Product Status	Active
Core Processor	PIC
Core Size	8-Bit
Speed	4MHz
Connectivity	I ² C, SPI, UART/USART
Peripherals	Brown-out Detect/Reset, POR, PWM, WDT
Number of I/O	22
Program Memory Size	7KB (4K x 14)
Program Memory Type	OTP
EEPROM Size	-
RAM Size	192 x 8
Voltage - Supply (Vcc/Vdd)	4V ~ 5.5V
Data Converters	A/D 5x8b
Oscillator Type	External
Operating Temperature	0°C ~ 70°C (TA)
Mounting Type	Through Hole
Package / Case	28-DIP (0.300", 7.62mm)
Supplier Device Package	28-SPDIP
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/pic16c73b-04-sp



TIMER1 MODULE

Timer1 Module Data Sheet Errata

Clarifications/Corrections to the Data Sheet:

In the Device data sheets listed below, the following clarifications and corrections should be noted. Any silicon issues related to the Timer1 Module will be reported in a separate silicon errata. Please check the Microchip web site for any existing issues.

Device	Data Sheet	Device	Data Sheet	Device	Data Sheet	Device	Data Sheet
PIC12F609	DS41302	PIC16F716	DS41206	PIC18F2321	DS39689	PIC18F6585	DS30491
PIC12HV609		PIC16F737	DS30498	PIC18F4321	DS39616	PIC18F6680	
PIC12F615		PIC16F747		PIC18F2331		PIC18F8585	
PIC12HV615		PIC16F767		PIC18F2431		PIC18F8680	
PIC12F617		PIC16F777	DS41249	PIC18F4331	DS30485	PIC18F24J10	DS39682
PIC12F629	DS41190	PIC16F785		PIC18F4431		PIC18F25J10	
PIC12F675	DS41232	PIC16HV785	DS39598	PIC18F2439		PIC18F44J10	
PIC16F636		PIC16F818		PIC18F2539		PIC18F45J10	DS39774
PIC16F639		PIC16F819		PIC18F4439	DS39632	PIC18F63J11	
PIC12F683	DS41211	PIC16F870	DS30569	PIC18F4539		PIC18F64J11	
PIC14000	DS40122	PIC16F871		PIC18F2455		PIC18F65J11	
PIC16C62A	DS30234	PIC16F872	DS30221	PIC18F2550	DS39637	PIC18F83J11	
PIC16C63		PIC16F873	DS30292	PIC18F4455		PIC18F84J11	DS39770
PIC16C64A		PIC16F874		PIC18F4550		PIC18F85J11	
PIC16C65A		PIC16F876		PIC18F2480	DS39636	PIC18F63J90	
PIC16C66		PIC16F877	DS39582	PIC18F4480		PIC18F64J90	
PIC16C67		PIC16F873A		PIC18F4580		PIC18F65J90	
PIC16C62B	DS35008	PIC16F874A		PIC18F2510	DS39631	PIC18F83J90	DS39663
PIC16C72A		PIC16F876A	DS41291	PIC18F2610		PIC18F84J90	
PIC16C63A		PIC16F877A		PIC18F4510		PIC18F85J90	
PIC16C65B	DS30605	PIC16F882		PIC18F4610	DS39625	PIC18F65J10	
PIC16C73B		PIC16F883	DS41250	PIC18F2520		PIC18F66J10	DS39663
PIC16C74B		PIC16F884		PIC18F4520		PIC18F67J10	
PIC16C72	DS30390	PIC16F886		PIC18F2585	DS39626	PIC18F85J10	
PIC16C73A		PIC16F887	DS41250	PIC18F2680		PIC18F85J15	
PIC16C74A		PIC16F913		PIC18F4585		PIC18F86J10	DS39663
PIC16C76		PIC16F914		PIC18F4680	DS39626	PIC18F85J15	
PIC16C77	DS41124	PIC16F916		PIC18F2620		PIC18F86J10	
PIC16C745		PIC16F917	DS41250	PIC18F4620		PIC18F85J15	
PIC16C765		PIC16F946				PIC18F87J10	

TIMER1 MODULE

Device	Data Sheet	Device	Data Sheet	Device	Data Sheet	Device	Data Sheet	
PIC16C773	DS30275	PIC17C42A	DS30412	PIC18F4685	DS39761	PIC18F65J50	DS39775	
PIC16C774		PIC17C43		PIC18F6390	DS39629	PIC18F66J50		
PIC16C923	DS30444	PIC17C44	PIC18F6490	PIC18F66J55				
PIC16C924		PIC17C752	PIC18F8390	PIC18F67J50				
PIC16C925	DS39544	PIC17C756A	PIC18F8490	PIC18F85J50				
PIC16C926		PIC17C762	PIC18F6520	DS39609	PIC18F85J55			
PIC16F72	DS39597	PIC17C766	PIC18F6620		PIC18F87J50			
PIC16F73	DS30325	PIC18C242	PIC18F6720		PIC18F66J11	DS39778		
PIC16F74		PIC18C252	PIC18F8520	PIC18F66J16				
PIC16F76		PIC18C442	PIC18F8620	PIC18F67J11				
PIC16F77		PIC18C452	PIC18F8720	PIC18F86J11				
PIC16F87	DS30487	PIC18C601	DS39541	PIC18F6525	DS39612		PIC18F86J16	DS39762
PIC16F88		PIC18C801		PIC18F6621		PIC18F87J11		
PIC16F610	DS41288	PIC18C658	DS30475	PIC18F8525		PIC18F66J60		
PIC16HV610		PIC18C858		PIC18F8621	PIC18F66J65			
PIC16F616		PIC18F242	DS39564	PIC18F6527	PIC18F67J60			
PIC16HV616		PIC18F252		PIC18F6622	PIC18F86J60			
PIC16F627A	DS40044	PIC18F442		PIC18F6627	PIC18F86J65			
PIC16F628A		PIC18F452		PIC18F6722	PIC18F87J60			
PIC16F648A		PIC18F248	DS39646	PIC18F8527	PIC18F96J60			
PIC16F630	DS40039	PIC18F258		PIC18F8622	PIC18F96J65			
PICF676		PIC18F458		PIC18F8627	PIC18F97J60			
PIC16F631	DS41262	PIC18F1220		DS39605	PIC18F8722			
PIC16F677		PIC18F1320						
PIC16F685		PIC18F1230	DS39758					
PIC16F687		PIC18F1330						
PIC16F689		PIC18F2220	DS39599					
PIC16F690		PIC18F2330						
PIC16F684	DS41202	PIC18F4220						
PIC16F688	DS41203	PIC18F4320						

1. Asynchronous Counter

When Timer1 is started or updated, the timer needs to see a falling edge from the external clock source before a rising edge can increment the counter. If writes to TMR1H and TMR1L are not completed while the external clock pulse is still high, Timer1 will miss counting the first clock pulse after the update.

When using an external crystal, the pulse width from rising to falling edge is temperature dependent and may decrease with temperature. As a result, the timer may require an additional oscillation to overflow.

Code examples are given for the affected devices:

- PIC12/14/16/17 devices – Example 1 and Example 2
- PIC18 devices – Example 3

Both examples include code to wait for Timer1 to increment twice between the `RTCisr` and `Update` labels.

In PIC18 devices, it is not possible to reliably update Timer1 in a *low-priority* interrupt. A high-priority interrupt could occur at any time and unexpectedly delay the TMR1 update.

PIC18 devices also include Timer3 which is functionally identical to Timer1.

Work around

Switching Timer1 to the main system oscillator after reloading, the timer ensures the timer will see a falling edge before switching back to the external clock source.

Due to the time from Timer1 overflow to the reload being application specific, wait for the timer to increment before beginning the reload sequence. This ensures the timer does not miss a rising edge during reload. The timing of the clock source changing is critical and is detailed in Example 1 and Example 2.

EXAMPLE 1: PIC12/14/16/17 CODE EXAMPLE FOR 1 SECOND OVERFLOW PERIOD WITH 32.786 KHZ OSCILLATOR

```
BTFSC    TMR1L,0
GOTO     $-1
BTFSS    TMR1L,0
GOTO     $-1          ;Timer has just incremented, 31 μs before next rising edge to
                     ;complete reload

Update:

    BCF    T1CON,TMR1CS    ;Select system clock for Timer1
    BSF    TMR1H,7         ;Timer1 high byte 0x80
    BCF    T1CON,TMR1ON    ;Timer1 off
    BSF    T1CON,TMR1C     ;Select external crystal
    BSF    T1CON,TMR1ON    ;Timer1 on
```

Critical Timing of code sequence for instructions following last write to TMR1L or TMR1H.

TIMER1 MODULE

EXAMPLE 2: PIC12/14/16/17 CODE EXAMPLE FOR OVERFLOW PERIODS OTHER THAN 1 SECOND OR USING AN OSCILLATOR OTHER THAN 32.768 KHZ

```
BTFSC    TMR1L, 0
GOTO     $-1
BTFSS    TMR1L, 0
GOTO     $-1                ;Timer has just incremented, 31µs before next rising
                             edge to complete reload.

BCF       T1CON, TMR1CS      ;Select system clock for Timer1.
MOVWF     TMR1, W            ;Sample low byte of Timer1 before increments.
ADDWF     TMR1_Reload_lo, F  ;Add reload value for low byte
BTFSC     STATUS, C          ;if this generates a carry then
INCF      TMR1_Reload_hi, F  ;modify the reload value for the high byte.

MOVWF     TMR1_Reload_hi, W  ;Reload Timer1 high byte.
MOVWF     TMR1H

MOVWF     TMR1_Reload_lo, W  ;Reload Timer1 low byte.
MOVWF     TMR1L

BCF       T1CON, TMR1ON      ;Timer1 off.
BSF       T1CON, TMR1CS      ;Select external crystal.
BSF       T1CON, TMR1ON      ;Timer1 on.
```

Critical Timing of code sequence for instructions.

EXAMPLE 3: PIC18 HIGH-PRIORITY INTERRUPT SERVICE ROUTINE

```
HintVector code 0x0008      ; (3-4Tcy), fixed interrupt latency
goto HighISR                ; (3Tcy) jump to high priority ISR code

                                code                ; unprotected code space
HighISR:
    btfss PIR1,TMR1IF        ; (1Tcy) TMR1 overflow?
    goto NextISR              ; (2Tcy) No, check another interrupt source

; Insert the next 4 lines of code when TMR1 can not
; be reliably updated before clock pulse goes low
RTCSir:
    btfsc TMR1L,0            ; wait for TMR1L<0> to become clear
    bra $-2                  ; may already be clear (loops for 0 to 30.5us)
    btfss TMR1L,0            ; wait for TMR1L<0> to become set
    bra $-2                  ; (loops for 30.5us)

; If TMR1 update can be completed before clock pulse
; goes low, start update here
Update:
    bsf TMR1H,7              ; reload for next 1 second overflow
    bcf PIR1,TMR1IF          ; clear flag
    incf Seconds,F           ; record second
    retfie FAST

NextISR:                      ; Another interrupt source...
    ....                    ; code for other interrupts, if needed

retfieFAST
```

REVISION HISTORY

Rev A Document (7/2007)

Initial release of this errata.

Rev B Document (03/2010)

Added PIC12F617 device to the Clarifications/
Corrections to the Data Sheet section.

TIMER1 MODULE

NOTES:

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

Information contained in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications. MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION, INCLUDING BUT NOT LIMITED TO ITS CONDITION, QUALITY, PERFORMANCE, MERCHANTABILITY OR FITNESS FOR PURPOSE. Microchip disclaims all liability arising from this information and its use. Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights.

Trademarks

The Microchip name and logo, the Microchip logo, dsPIC, KEELOQ, KEELOQ logo, MPLAB, PIC, PICmicro, PICSTART, PIC³² logo, rfPIC and UNI/O are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.


FilterLab, Hampshire, HI-TECH C, Linear Active Thermistor, MXDEV, MXLAB, SEEVAL and The Embedded Control Solutions Company are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Analog-for-the-Digital Age, Application Maestro, CodeGuard, dsPICDEM, dsPICDEM.net, dsPICworks, dsSPEAK, ECAN, ECONOMONITOR, FanSense, HI-TIDE, In-Circuit Serial Programming, ICSP, Mindi, MiWi, MPASM, MPLAB Certified logo, MPLIB, MPLINK, mTouch, Octopus, Omniscient Code Generation, PICC, PICC-18, PICDEM, PICDEM.net, PICkit, PICTail, REAL ICE, rLAB, Select Mode, Total Endurance, TSHARC, UniWinDriver, WiperLock and ZENA are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

All other trademarks mentioned herein are property of their respective companies.

© 2010, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

 Printed on recycled paper.

ISBN: 978-1-60932-048-5

Microchip received ISO/TS-16949:2002 certification for its worldwide headquarters, design and wafer fabrication facilities in Chandler and Tempe, Arizona; Gresham, Oregon and design centers in California and India. The Company's quality system processes and procedures are for its PIC® MCUs and dsPIC® DSCs, KEELOQ® code hopping devices, Serial EEPROMs, microperipherals, nonvolatile memory and analog products. In addition, Microchip's quality system for the design and manufacture of development systems is ISO 9001:2000 certified.

QUALITY MANAGEMENT SYSTEM
CERTIFIED BY DNV
== ISO/TS 16949:2002 ==



WORLDWIDE SALES AND SERVICE

AMERICAS

Corporate Office

2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7200
Fax: 480-792-7277
Technical Support:
<http://support.microchip.com>
Web Address:
www.microchip.com

Atlanta

Duluth, GA
Tel: 678-957-9614
Fax: 678-957-1455

Boston

Westborough, MA
Tel: 774-760-0087
Fax: 774-760-0088

Chicago

Itasca, IL
Tel: 630-285-0071
Fax: 630-285-0075

Cleveland

Independence, OH
Tel: 216-447-0464
Fax: 216-447-0643

Dallas

Addison, TX
Tel: 972-818-7423
Fax: 972-818-2924

Detroit

Farmington Hills, MI
Tel: 248-538-2250
Fax: 248-538-2260

Kokomo

Kokomo, IN
Tel: 765-864-8360
Fax: 765-864-8387

Los Angeles

Mission Viejo, CA
Tel: 949-462-9523
Fax: 949-462-9608

Santa Clara

Santa Clara, CA
Tel: 408-961-6444
Fax: 408-961-6445

Toronto

Mississauga, Ontario,
Canada
Tel: 905-673-0699
Fax: 905-673-6509

ASIA/PACIFIC

Asia Pacific Office

Suites 3707-14, 37th Floor
Tower 6, The Gateway
Harbour City, Kowloon
Hong Kong
Tel: 852-2401-1200
Fax: 852-2401-3431

Australia - Sydney

Tel: 61-2-9868-6733
Fax: 61-2-9868-6755

China - Beijing

Tel: 86-10-8528-2100
Fax: 86-10-8528-2104

China - Chengdu

Tel: 86-28-8665-5511
Fax: 86-28-8665-7889

China - Chongqing

Tel: 86-23-8980-9588
Fax: 86-23-8980-9500

China - Hong Kong SAR

Tel: 852-2401-1200
Fax: 852-2401-3431

China - Nanjing

Tel: 86-25-8473-2460
Fax: 86-25-8473-2470

China - Qingdao

Tel: 86-532-8502-7355
Fax: 86-532-8502-7205

China - Shanghai

Tel: 86-21-5407-5533
Fax: 86-21-5407-5066

China - Shenyang

Tel: 86-24-2334-2829
Fax: 86-24-2334-2393

China - Shenzhen

Tel: 86-755-8203-2660
Fax: 86-755-8203-1760

China - Wuhan

Tel: 86-27-5980-5300
Fax: 86-27-5980-5118

China - Xian

Tel: 86-29-8833-7252
Fax: 86-29-8833-7256

China - Xiamen

Tel: 86-592-2388138
Fax: 86-592-2388130

China - Zhuhai

Tel: 86-756-3210040
Fax: 86-756-3210049

ASIA/PACIFIC

India - Bangalore

Tel: 91-80-3090-4444
Fax: 91-80-3090-4123

India - New Delhi

Tel: 91-11-4160-8631
Fax: 91-11-4160-8632

India - Pune

Tel: 91-20-2566-1512
Fax: 91-20-2566-1513

Japan - Yokohama

Tel: 81-45-471- 6166
Fax: 81-45-471-6122

Korea - Daegu

Tel: 82-53-744-4301
Fax: 82-53-744-4302

Korea - Seoul

Tel: 82-2-554-7200
Fax: 82-2-558-5932 or
82-2-558-5934

Malaysia - Kuala Lumpur

Tel: 60-3-6201-9857
Fax: 60-3-6201-9859

Malaysia - Penang

Tel: 60-4-227-8870
Fax: 60-4-227-4068

Philippines - Manila

Tel: 63-2-634-9065
Fax: 63-2-634-9069

Singapore

Tel: 65-6334-8870
Fax: 65-6334-8850

Taiwan - Hsin Chu

Tel: 886-3-6578-300
Fax: 886-3-6578-370

Taiwan - Kaohsiung

Tel: 886-7-536-4818
Fax: 886-7-536-4803

Taiwan - Taipei

Tel: 886-2-2500-6610
Fax: 886-2-2508-0102

Thailand - Bangkok

Tel: 66-2-694-1351
Fax: 66-2-694-1350

EUROPE

Austria - Wels

Tel: 43-7242-2244-39
Fax: 43-7242-2244-393

Denmark - Copenhagen

Tel: 45-4450-2828
Fax: 45-4485-2829

France - Paris

Tel: 33-1-69-53-63-20
Fax: 33-1-69-30-90-79

Germany - Munich

Tel: 49-89-627-144-0
Fax: 49-89-627-144-44

Italy - Milan

Tel: 39-0331-742611
Fax: 39-0331-466781

Netherlands - Drunen

Tel: 31-416-690399
Fax: 31-416-690340

Spain - Madrid

Tel: 34-91-708-08-90
Fax: 34-91-708-08-91

UK - Wokingham

Tel: 44-118-921-5869
Fax: 44-118-921-5820